* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the semiconductor device of flip chip structure.
[0002]
[Description of the Prior Art] In order to realize small electronic equipment, they are miniaturized electronic parts attaining advanced features and high integration. Electronic parts, for example, a semiconductor device, are attaining much more miniaturization by including this in a direct wiring substrate using the bare chip which does not carry out sheathing, although what generally carried out sheathing by resin is used. This seed semiconductor device is explained from drawing 7 . In drawing, 1 is a semi-conductor pellet and forms many bump electrodes 3 along the 1 principal-plane periphery of the semi-conductor substrate 2 in which the semiconductor device (not shown) was formed inside. 4 is a wiring substrate and forms the pad electrode 6 in one principal plane of the insulating substrates 5, such as thermosetting resin, corresponding to the bump electrode 3 of the semi-conductor pellet 1. It was made to counter so that the bump electrode 3 and the pad electrode 6 may carry out the polymerization of this semi-conductor pellet 1 and the wiring substrate 4, and between each opposed face is pasted up with resin 7 in the condition of having pressurized the polymerization section and having made it connecting electrically. In this semiconductor device, it forms by plating or the ball bonding method, and it is maintaining the electrical installation of the polymerization section of each electrode at the copper layer by the volumetric shrinkage at the time of the plastic deformation of the bump electrode 3, and hardening of resin 7, using the pad electrode 6 as the structure which plated hard nickel and covered gold thinly further, using gold as an electrode material of the bump electrode 3. Although the semiconductor device of such structure can be integrated highly thinly, the temperature rise of the part on which the calorific value per opposite side unit volume was also large, and mounted the semi-conductor pellet 1 of the wiring substrate 4 is locally carried out to an elevated temperature. Therefore, although this semiconductor device produces curvature according to the difference of the coefficient of thermal expansion of the semi-conductor pellet 1 and the wiring substrate 4, since the whole surface of the semi-conductor pellet 1 has pasted up with resin 7, electrical installation is maintained although the minute distance location gap of the bump electrode 3 and the pad electrode 6 is carried out in the direction of a polymerization side. However, since resin 7 is wide opened outside out of the side attachment wall of the semi-conductor

pellet 1, When a crack detailed in a part with small bond strength existing in the adhesion interface of resin 7 arises, Crack A advances within between [of the semi-conductor pellet 1 and the wiring substrate 4] opposed faces, the semi-conductor pellet 1 was made to exfoliate from the wiring substrate 4, as shown in drawing 8 , the contact pressure of the bump electrode 3 and the pad electrode 6 was reduced, and there was a problem of spoiling electrical installation. On the other hand, the semiconductor device of the structure shown in drawing 9 is indicated by JP,6-45402,A. In drawing, 8 is a rectangular semi-conductor pellet, as shown in drawing 10 , it forms many minor diameter bump electrodes 10 in the periphery of one principal plane of the semi-conductor substrate 9 on a straight line, and it forms the bump electrode 11 of path size in the array direction both ends located in the corner section. Each bump electrodes 10 and 11 consist of solder, and are spherically formed at the time of semi-conductor pellet 8 independent one. 12 is a wiring substrate, as shown in drawing 11 , it is the thing in which the pad electrodes 14 and 15 by the electric conduction film were formed on the insulating substrate 13, and each pad electrodes 14 and 15 are formed with the dimension corresponding to the location which corresponds with the bump electrodes 10 and 11 of the semi-conductor pellet 8. Each pad electrodes 14 and 15 also consist of solder, at the time of wiring substrate 12 independent one, a flat-surface configuration is a rectangle-like and the pad electrode 15 of path size is formed in the flat side in the shape of [with the pad electrode 14 of **** a little smaller than the bump electrode 10] a ball. In addition, the illustration abbreviation is carried out although a substrate electrode is formed in each electrodes 10, 11, 14, and 15. By carrying out opposite arrangement of the semi-conductor pellet 8, carrying out the polymerization of each electrode, and supplying into an elevated-temperature ambient atmosphere on this wiring substrate 12, as shown in drawing 12 , the solder of each electrode material is melted and the semiconductor device of the structure which carried out electrical installation with the solder electrode 16 unified as shown in drawing 9 is obtained. This semiconductor device makes path size the bump electrode 11 located in the corner section of the semi-conductor pellet 8 from the bump electrode 10 of other parts, the location gap at the time of solder melting avoids, although the problem produced by thermal expansion does not cope with, the bump electrode located in the corner section of a semi-conductor pellet can make into path size, the connection resilience of a semi-conductor pellet and a wiring substrate can raise, and it is thought possible applying this technique to drawing 7 equipment.

[0003]

[Problem(s) to be Solved by the Invention] However, although the semi-conductor pellet 8 and the wiring substrate 12 are directly connected to thermal connection by the solder electrode 16 with drawing 9 equipment, since thermal connection is made by radiation through air, other parts become inadequate and a temperature rise is remarkable [parts / heat dissipation of the semi-conductor pellet 8]. Therefore, if it is unsuitable for the semiconductor device accompanied by big generation of heat and a temperature rise is remarkable, the stress of thermal expansion and contraction will concentrate on the solder electrode located in the corner section which is most distant from the flat-surface core of the semi-conductor pellet 8. Therefore, even if it made the solder electrode of the corner section into path size to the semi-conductor pellet 8 in the thing using an insulating material with a big coefficient of thermal expansion as a wiring substrate 12, when thermal expansion and contraction were repeated, the crack was produced between the solder

electrode and the substrate electrode, and the problem of spoiling electrical installation was still left behind.
[0004]
[Means for Solving the Problem] This invention is what was proposed for the purpose of solution of the technical problem which the semiconductor device shown in drawing 7 has. The semi-conductor pellet which formed many bump electrodes along the periphery of one principal plane, said bump electrode, and the wiring substrate in which the pad electrode was formed in the corresponding location are made to counter. In the semiconductor device of flip chip structure on which the polymerization of said bump electrode and pad electrode was carried out, they were electrically connected to, and between the opposed faces of a semi-conductor pellet and a wiring substrate was pasted up by resin The path of the bump electrode located in each corner section of said semi-conductor pellet and a wiring substrate and a pad electrode is made larger than the path of the bump electrode located in other fields, and a pad electrode. The semiconductor device characterized by making the resin on which a semi-conductor pellet and a wiring substrate are pasted up extend to a way field outside a path size electrode is offered.
[0005]
[Embodiment of the Invention] The semiconductor device by this invention makes the semi-conductor pellet which has a bump electrode, and the wiring substrate in which the pad electrode was formed counter. It is a thing about the semiconductor device on which the polymerization of each electrode was carried out, it was electrically connected to, and between the opposed faces of a semi-conductor pellet and a wiring substrate was pasted up by resin. Although the path of the bump electrode located in each corner section of a semi-conductor pellet and a wiring substrate and a pad electrode is made larger than the path of the bump electrode located in other fields, and a pad electrode and it is characterized by making the resin on which a semi-conductor pellet and a wiring substrate are pasted up extend to a way field outside a path size electrode A path size electrode can also make path size two or more electrodes it not only forms uniquely, but adjoined each other and located in the corner section. Moreover, the bump electrode and pad electrode which are located in the corner section can also be used as the dummy electrode which is unrelated to the semiconductor device inside a semi-conductor pellet.
[0006]
[Example] The example of this invention is explained from drawing 1 below. In drawing, the explanation which gives the same sign to the same object as drawing 7 , and overlaps is omitted. Carrying out difference to the drawing 7 equipment in drawing forms the bump electrode 17 of path size from the bump electrode 3 formed in the principal plane corner section of the semi-conductor pellet 1 along other principal plane peripheries as shown in drawing 2 . It is having only made the resin 7 on which having formed the pad electrode 18 of path size in the path size bump electrode 17 on the wiring substrate 4 and the location which counters as shown in drawing 3 , and the semi-conductor pellet 1 and the wiring substrate 4 are pasted up extend to the way field B outside the path size electrodes 17 and 18. Moreover, similarly height is set up by paths only differing, and it is set as the height same [the bump electrodes 3 and 17] only by paths differing as the pad electrodes 6 and 18. In the case of the semi-conductor pellet of 15mm angle, as a concrete example of each electrode, the path size bump electrode 17 of the **** bump electrode 3 is 150micrometerx150micrometer at 100micrometerx100micrometer and array interval of 200

micrometers. It is formed in height of 60 micrometers of both gold plate, and the pad electrodes 6 and 18 of the wiring substrate 4 form a nickel layer with a thickness of 3-5 micrometers on a copper circuit pattern with a thickness of 18 micrometers. It is what furthermore formed the gold plate layer with a thickness of 0.03-0.05 micrometers, and is set as the same flat-surface configuration as a corresponding bump electrode, and the dimension. While the wiring substrate 4 is laid on a flat side, and is heated by about 80 degrees C, and position and the bump electrode carries out the polymerization of the semi-conductor pellet 1 held by adsorption means to have a heating means so that the pad electrode on the wiring substrate 4 may lap, and supplying liquefied resin 7 between the semi-conductor pellet 1 and the wiring substrate 4, heating at about 200 degrees C and stiffening resin 7, between opposed faces is pasted up. The fluidized resin 7 is opened to the way field B outside the path size bump electrode 17, and it is made for the whole rear-face surface of the semi-conductor pellet 1 to paste the wiring substrate 4 at this time. consequently, in the corner section of the semi-conductor pellet 1 which the stress produced by thermal expansion concentrates most, resin 7 carries out covering adhesion of the side attachment wall of the semi-conductor pellet 1 and the bump electrode 17 of path size, and the wiring substrate 4 continuously, moreover, since the area of the side attachment wall of the path size bump electrode 17 is larger than the area of the bump electrode 3 of ****, bond strength boils it markedly and it improves. Moreover, as shown in drawing 4 , the minute crack C is produced to the resin field B of the corner section of the semi-conductor pellet 1, and even if this tends to grow and it is going to go on inside the semi-conductor pellet 1, advance of a crack is prevented by short distance with the bump electrode 17 of path size. Also where advance of this crack is stopped with the path size bump electrode 17, since the perimeter has pasted up with resin 7, spacing of the semi-conductor pellet 1 and the wiring substrate 4 is maintained, the contact pressure of other **** bump electrodes 3 and the pad electrode 6 is maintained, and the polymerization section of the bump electrode 17 and the pad electrode 18 can maintain electrical installation. Drawing 5 shows the modification of this invention. In drawing, the explanation which gives the same sign to the same object as drawing 7 and drawing 1 , and overlaps is omitted. It only carries out difference in drawing that made into path size the bump electrode 19 contiguous to the bump electrode 17 of the path size formed in the array direction both ends of the bump electrode 3 like the bump electrode 17 as shown in drawing 6 , and the pad electrode of the wiring substrate 4 also formed the pad electrodes 18 and 20 corresponding to the path size bump electrodes 17 and 19 in path size. By this, the area of the closure field by the resin 7 of the corner section of the semi-conductor pellet 1 can be reduced, the distance from the external surface of resin 7 to the path size electrodes 17, 18, 19, and 20 can be shortened, even if it produces a minute crack in the external surface and adhesion interface of resin 7, the advance can be prevented by short distance, and exfoliation of the semi-conductor pellet 1 can be prevented. In addition, although each path size electrode was set as the same configuration and the dimension in the example shown in drawing 6 , the path size electrode 19 which adjoins the **** electrode 3 as shown, for example in drawing 7 is the same width of face as the **** electrode 3, and can be set as arbitration, such as setting up die length similarly to the path size electrode 17 of both ends. Moreover, although a path size electrode can be used as a terminal with which the principal current of a power supply terminal, an earth terminal, etc. flows when connecting the path size bump electrodes 17 and 19 with the internal component of the semi-conductor pellet 1 electrically and making

external connection with the pad electrodes 18 and 20, it not only connects this path size electrode internally, but it can use it as a dummy electrode electrically separated from the internal component. in this case, two or more dummy bump electrodes -- one by one -- electric -- connecting -- this serial -- the short circuit condition by the conductor is supervised by the pad electrode side, and before the electrical installation of a **** electrode is spoiled by detecting having changed from the short circuit condition to the open condition, it can also use as a sensor to detect that the semi-conductor pellet 1 exfoliated.
[0007]
[Effect of the Invention] According to this invention, even if it produces a minute crack to the resin on which a semi-conductor pellet and a wiring substrate are pasted up, advance of this crack can be prevented by short distance, and the electrical installation of the bump electrode of **** and pad electrode by which pressure-welding connection is made can be kept above.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The semi-conductor pellet which formed many bump electrodes along the periphery of one principal plane, said bump electrode, and the wiring substrate in which the pad electrode was formed in the corresponding location are made to counter. In the semiconductor device on which the polymerization of said bump electrode and pad electrode was carried out, they were electrically connected to, and between the opposed faces of a semi-conductor pellet and a wiring substrate was pasted up by resin The path of the bump electrode located in each corner section of said semi-conductor pellet and a wiring substrate and a pad electrode is made larger than the path of the bump electrode located in other fields, and a pad electrode. The semiconductor device characterized by making the resin on which a semi-conductor pellet and a wiring substrate are pasted up extend to a way field outside a path size electrode is offered.
[Claim 2] The semiconductor device according to claim 1 characterized by making larger than the path of the bump electrode located in other fields, and a pad electrode the path of two or more bump electrodes adjoined each other and located in each corner section of said semi-conductor pellet and a wiring substrate, and a pad electrode.
[Claim 3] The semiconductor device according to claim 1 characterized by using as a dummy electrode the bump electrode and pad electrode which are located in the corner section.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional side elevation of the semiconductor device in which the example of this invention is shown
[Drawing 2] The perspective view of the semi-conductor pellet used for drawing 1 equipment
[Drawing 3] The important section perspective view of the wiring substrate used for drawing 1 equipment
[Drawing 4] The partial expansion sectional side elevation explaining the effectiveness of drawing 1 equipment
[Drawing 5] The partial expansion sectional side elevation showing other examples of this invention
[Drawing 6] The part plan of a semi-conductor pellet used for drawing 5 equipment
[Drawing 7] The sectional side elevation showing an example of the conventional semiconductor device
[Drawing 8] The partial expansion sectional side elevation explaining the technical problem of drawing 7 equipment of a semi-conductor pellet
[Drawing 9] The sectional side elevation showing the semiconductor device with which the former differs
[Drawing 10] The perspective view of the semi-conductor pellet used for drawing 9 equipment
[Drawing 11] The important section perspective view of the wiring substrate used for drawing 9 equipment
[Drawing 12] The sectional side elevation explaining the manufacture approach of drawing 9 equipment
[Description of Notations]
1 Semi-conductor Pellet
3 Bump Electrode (**** Pad Electrode)
4 Wiring Substrate
6 Pad Electrode (**** Pad Electrode)
7 Resin
17 Path Size Bump Electrode
18 Path Size Pad Electrode

[Translation done.]

PAT-NO: JP410303249A

DOCUMENT-IDENTIFIER: JP 10303249 A

TITLE: SEMICONDUCTOR DEVICE

PUBN-DATE: November 13, 1998

INVENTOR-INFORMATION:
NAME
IKEGAMI, GORO

ASSIGNEE-INFORMATION:

NAME	COUNTRY
NEC KANSAI LTD	N/A

APPL-NO: JP09109958

APPL-DATE: April 28, 1997

INT-CL (IPC): H01L021/60, H01L021/321

ABSTRACT:

PROBLEM TO BE SOLVED: To keep electric connection between the bump electrodes and pad electrodes of small sizes which are pressure-connected, by eliminating the progress of a crack in a short distance even if the micro crack is developed in resin adhering a semiconductor pellet to a wiring board.

SOLUTION: In a semiconductor device, a semiconductor pellet 1 where the multiple bump electrodes 3 are formed along the peripheral edge of one main face is made to face the wiring board 4 where the pad electrodes 6 are formed in positions corresponding to the bump electrodes 3. The bump electrodes 3 and the pad electrodes 6 are stacked and are electrically connected. The confronted faces of the semiconductor pellet 1 and the wiring board 4 are adhered by resin 7. The sizes of the bump electrodes 17 and the pad electrodes
18 positioned at the corners of the semiconductor pellet 1 and the wiring board 4 are made larger than those of the bump electrodes 3 and the pad electrodes 6 positioned in the other areas. Resin 7 making the semiconductor pellet 1

adhere to the wiring board 4 is extended to the outer area of the large electrodes 17.

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平10－303249

(43)公開日　平成10年(1998)11月13日

(51)Int.Cl.[6]	識別記号	ＦＩ	
Ｈ０１Ｌ　21/60	３１１	Ｈ０１Ｌ　21/60	３１１Ｓ
// Ｈ０１Ｌ　21/321		21/92	６０２Ｑ

審査請求　未請求　請求項の数３　ＯＬ　（全　５　頁）

(21)出願番号　特願平9－109958

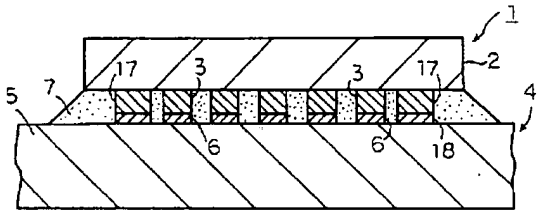
(22)出願日　平成９年(1997)４月28日

(71)出願人　000156950
関西日本電気株式会社
滋賀県大津市晴嵐２丁目９番１号

(72)発明者　池上　五郎
滋賀県大津市晴嵐２丁目９番１号　関西日本電気株式会社内

(54)【発明の名称】　半導体装置

(57)【要約】
【課題】半導体ペレットと配線基板とを接着する樹脂にクラックを生じるとバンプ電極とパッド電極の圧接力が低下して電気的接続が損なわれる。
【解決手段】一主面の周縁に沿って多数のバンプ電極３を形成した半導体ペレット１と前記バンプ電極３と対応する位置にパッド電極６を形成した配線基板４とを対向させ、前記バンプ電極３とパッド電極６とを重合させて電気的に接続し、半導体ペレット１と配線基板４の対向面間を樹脂７にて接着した半導体装置において、前記半導体ペレット１及び配線基板４のそれぞれのコーナ部に位置するバンプ電極１７及びパッド電極１８の径を他の領域に位置するバンプ電極３及びパッド電極６の径より大きくし、半導体ペレット１と配線基板４とを接着する樹脂７を径大電極１７の外方領域まで延在させたことを特徴とする半導体装置を提供する。



1

【特許請求の範囲】

【請求項１】一主面の周縁に沿って多数のバンプ電極を形成した半導体ペレットと前記バンプ電極と対応する位置にパッド電極を形成した配線基板とを対向させ、前記バンプ電極とパッド電極とを重合させて電気的に接続し、半導体ペレットと配線基板の対向面間を樹脂にて接着した半導体装置において、

前記半導体ペレット及び配線基板のそれぞれのコーナ部に位置するバンプ電極及びパッド電極の径を他の領域に位置するバンプ電極及びパッド電極の径より大きくし、半導体ペレットと配線基板とを接着する樹脂を径大電極の外方領域まで延在させたことを特徴とする半導体装置を提供する。

【請求項２】前記半導体ペレット及び配線基板のそれぞれのコーナ部で隣り合って位置する複数のバンプ電極及びパッド電極の径を他の領域に位置するバンプ電極及びパッド電極の径より大きくしたことを特徴とする請求項１に記載の半導体装置。

【請求項３】コーナ部に位置するバンプ電極及びパッド電極をダミー電極とすることを特徴とする請求項１に記載の半導体装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明はフリップチップ構造の半導体装置に関する。

【０００２】

【従来の技術】小型の電子機器を実現するために電子部品は高機能化、高集積化を図りつつ小型化されている。電子部品、例えば半導体装置は一般的に樹脂で外装したものが用いられるが、外装しないベアチップを用い、これを直接配線基板に組み込むことにより一層の小型化を図っている。この種半導体装置を図７から説明する。図において、１は半導体ペレットで、内部に半導体素子（図示せず）を形成した半導体基板２の一主面周縁に沿ってバンプ電極３を多数形成している。４は配線基板で、熱硬化性樹脂などの絶縁基板５の一主面に半導体ペレット１のバンプ電極３と対応してパッド電極６を形成している。この半導体ペレット１と配線基板４とをバンプ電極３とパッド電極６が重合するように対向させ、重合部を加圧して電気的に接続させた状態で、各対向面間を樹脂７により接着している。この半導体装置では、バンプ電極３の電極材料として金を用い、メッキやボールボンディング法により形成し、パッド電極６は銅層に硬質のニッケルをメッキしさらに金を薄く被覆した構造として、バンプ電極３の塑性変形と樹脂７の硬化時の体積収縮により各電極の重合部の電気的接続を保っている。このような構造の半導体装置は薄く高集積化できるが、反面単位体積当たりの発熱量も大きく、配線基板４の半導体ペレット１をマウントした部分を局所的に高温に温度上昇させる。そのため、半導体ペレット１と配線基板

2

４の熱膨張率の差によりこの半導体装置は反りを生じるが、半導体ペレット１の全面が樹脂７により接着されているため、バンプ電極３とパッド電極６とは重合面方向に微小距離位置ずれするものの、電気的接続は保たれる。しかしながら、樹脂７は半導体ペレット１の側壁外で外部に開放されるため、樹脂７の接着界面に接着強度の小さい部分が存在したり、微細なクラックが生じた場合、図８に示すようにクラックＡが半導体ペレット１と配線基板４の対向面間内に進行し、半導体ペレット１を配線基板４から剥離させ、バンプ電極３とパッド電極６の圧接力を低下させ電気的接続を損なうという問題があった。一方、特開平６－４５４０２号公報には図９に示す構造の半導体装置が開示されている。図において、８は矩形の半導体ペレットで、図１０に示すように半導体基板９の一主面の周縁に一直線上に多数の小径バンプ電極１０を形成し、コーナ部に位置する配列方向両端には径大のバンプ電極１１を形成している。各バンプ電極１０、１１は半田からなり半導体ペレット８単独の時には球状に形成されている。１２は配線基板で、図１１に示すように絶縁基板１３上に導電膜によるパッド電極１４、１５を形成したもので、各パッド電極１４、１５は半導体ペレット８のバンプ電極１０、１１と対応する位置に、対応する寸法で形成されている。各パッド電極１４、１５も半田からなり配線基板１２単独の時には平面形状は矩形状で、径小のパッド電極１４はバンプ電極１０よりやや小さい球状に、径大のパッド電極１５は平坦面に形成されている。尚、各電極１０、１１、１４、１５には下地電極が形成されるが図示省略している。この配線基板１２上に図１２に示すように半導体ペレット８を対向配置して各電極を重合させ高温雰囲気中に供給することにより各電極材料の半田を溶かし、図９に示すように一体化した半田電極１６により電気的接続をした構造の半導体装置を得る。この半導体装置は半導体ペレット８のコーナ部に位置するバンプ電極１１を他の部分のバンプ電極１０より径大にして、半田溶融時の位置ずれを回避するもので、熱膨張により生じる問題に対応するものではないが半導体ペレットのコーナ部に位置するバンプ電極を径大にして半導体ペレットと配線基板の接続強度を高めることができ、この技術を図７装置に適用することは可能と考えられる。

【０００３】

【発明が解決しようとする課題】しかしながら、図９装置では半導体ペレット８と配線基板１２は熱的接続に半田電極１６によって直接的に接続されているが、他の部分は空気を介して輻射により熱的接続がなされるため、半導体ペレット８の放熱は不十分となり温度上昇が著しい。　そのため、大きな発熱を伴う半導体装置には不向きで、温度上昇が著しいと半導体ペレット８の平面中心からもっとも離れたコーナ部に位置する半田電極に熱膨張、収縮の応力が集中する。そのため配線基板１２とし

て半導体ペレット８に対して熱膨張係数の大きな絶縁材料を用いたものでは、コーナ部の半田電極を径大にしても熱膨張、収縮を繰り返すと半田電極と下地電極との間でクラックを生じ、電気的接続を損なうという問題は依然として残されていた。

【０００４】

【課題を解決するための手段】本発明は図７に示す半導体装置が有する課題の解決を目的として提案されたもので、一主面の周縁に沿って多数のバンプ電極を形成した半導体ペレットと前記バンプ電極と対応する位置にパッド電極を形成した配線基板とを対向させ、前記バンプ電極とパッド電極とを重合させて電気的に接続し、半導体ペレットと配線基板の対向面間を樹脂にて接着したフリップチップ構造の半導体装置において、前記半導体ペレット及び配線基板のそれぞれのコーナ部に位置するバンプ電極及びパッド電極の径を他の領域に位置するバンプ電極及びパッド電極の径より大きくし、半導体ペレットと配線基板とを接着する樹脂を径大電極の外方領域まで延在させたことを特徴とする半導体装置を提供する。

【０００５】

【発明の実施の形態】本発明による半導体装置は、バンプ電極を有する半導体ペレットとパッド電極を形成した配線基板とを対向させ、各電極を重合させて電気的に接続し、半導体ペレットと配線基板の対向面間を樹脂にて接着した半導体装置に関するもので、半導体ペレット及び配線基板のそれぞれのコーナ部に位置するバンプ電極及びパッド電極の径を他の領域に位置するバンプ電極及びパッド電極の径より大きくし、半導体ペレットと配線基板とを接着する樹脂を径大電極の外方領域まで延在させたことを特徴とするが、径大電極はコーナ部で唯一形成するだけでなく、隣り合って位置する複数の電極を径大にすることも出来る。また、コーナ部に位置するバンプ電極及びパッド電極は半導体ペレット内部の半導体素子とは関係のないダミー電極とすることも出来る。

【０００６】

【実施例】以下に本発明の実施例を図１から説明する。図において、図７と同一物には同一符号を付し重複する説明を省略する。図中図７装置と相異するのは図２に示すように半導体ペレット１の主面コーナ部に他の主面周縁に沿って形成したバンプ電極３より径大のバンプ電極１７を形成し、図３に示すように配線基板４上の径大バンプ電極１７と対向する位置に径大のパッド電極１８を形成したことと、半導体ペレット１と配線基板４とを接着する樹脂７を径大電極１７、１８の外方領域Ｂまで延在させたことのみである。またバンプ電極３、１７は径が異なるだけで、高さは同じに設定され、パッド電極６、１８も径が異なるだけで同じ高さに設定されている。電極それぞれの具体的例として、１５ｍｍ角の半導体ペレットの場合、径小バンプ電極３は１００μｍ×１００μｍ、配列間隔２００μｍに、径大バンプ電極１７は１５０μｍ×１５０μｍで、共に金メッキにより高さ６０μｍに形成され、配線基板４のパッド電極６、１８は厚さ１８μｍの銅の配線パターン上に厚さ３～５μｍのニッケル層を形成し、さらに厚さ０．０３～０．０５μｍの金メッキ層を形成したもので、対応するバンプ電極と同じ平面形状、寸法に設定されている。配線基板４は平坦面上に載置されて８０℃程度に加熱され、加熱手段を有する吸着手段により保持された半導体ペレット１を、そのバンプ電極が配線基板４上のパッド電極とが重なるように位置決めして重合させ、半導体ペレット１と配線基板４の間に液状樹脂７を供給して２００℃程度に加熱して樹脂７を硬化させるとともに対向面間を接着する。この時、流動化した樹脂７を径大バンプ電極１７の外方領域Ｂまで広げ、半導体ペレット１の裏面全面が配線基板４に接着されるようにする。この結果、熱膨張により生じる応力が最も集中する半導体ペレット１のコーナ部で、樹脂７は半導体ペレット１、径大のバンプ電極１７の側壁、配線基板４を連続して被覆接着し、しかも径大バンプ電極１７の側壁の面積は径小のバンプ電極３の面積よりも広いため接着強度が格段に向上する。また、図４に示すように半導体ペレット１のコーナ部の樹脂領域Ｂに微小クラックＣを生じ、これが成長して半導体ペレット１の内部に進行しようとしても、径大のバンプ電極１７によってクラックの進行が短距離で阻止される。このクラックの進行が径大バンプ電極１７で停止させられた状態でも、バンプ電極１７とパッド電極１８の重合部は全周が樹脂７によって接着されているため、半導体ペレット１と配線基板４の間隔が保たれ、他の径小バンプ電極３とパッド電極６の圧接力が維持され電気的接続を保つことが出来る。図５は本発明の変形例を示す。図において、図７、図１と同一物には同一符号を付し重複する説明を省略する。図中相異するのは、図６に示すようにバンプ電極３の配列方向両端に形成した径大のバンプ電極１７と隣接するバンプ電極１９をバンプ電極１７と同様に径大とし、配線基板４のパッド電極も径大バンプ電極１７、１９に対応するパッド電極１８、２０を径大に形成したことのみである。これにより、半導体ペレット１のコーナ部の樹脂７による封止領域の面積が縮小され、樹脂７の外面から径大電極１７、１８、１９、２０までの距離が短縮され、樹脂７の外面や接着界面に微小クラックを生じてもその進行を短距離で阻止でき、半導体ペレット１の剥離を防止できる。尚、図６に示す例では各径大電極を同じ形状、寸法に設定したが、例えば図７に示すように径小電極３と隣り合う径大電極１９は径小電極３と同じ幅で、長さを両端の径大電極１７と同じに設定するなど任意に設定できる。また、径大バンプ電極１７、１９を半導体ペレット１の内部素子と電気的に接続しパッド電極１８、２０により外部接続する場合には、径大電極を電源端子や接地端子などの主電流が流れる端子として用いることが出来るが、この径大

5

電極は内部接続するだけでなく、内部素子から電気的に分離されたダミー電極として用いることもできる。この場合、複数のダミーバンプ電極を順次電気的に接続し、この直列導体による短絡状態をパッド電極側で監視し、短絡状態から開放状態に変化したことを検知することによって径小電極の電気的接続が損なわれる前に半導体ペレット１が剥離したことを検知するセンサとして用いることも出来る。

【０００７】

【発明の効果】以上のように本発明によれば、半導体ペレットと配線基板を接着する樹脂に微小クラックを生じても、このクラックの進行を短距離で阻止でき、圧接接続される径小のバンプ電極とパッド電極との電気的接続を保つことが出来る。

【図面の簡単な説明】

【図１】　本発明の実施例を示す半導体装置の側断面図

【図２】　図１装置に用いられる半導体ペレットの斜視図

【図３】　図１装置に用いられる配線基板の要部斜視図

【図４】　図１装置の効果を説明する部分拡大側断面図

6

【図５】　本発明の他の実施例を示す部分拡大側断面図

【図６】　図５装置に用いられる半導体ペレットの部分平面図

【図７】　従来の半導体装置の一例を示す側断面図

【図８】　図７装置の課題を説明する半導体ペレットの部分拡大側断面図

【図９】　従来の異なる半導体装置を示す側断面図

【図１０】　図９装置に用いられる半導体ペレットの斜視図

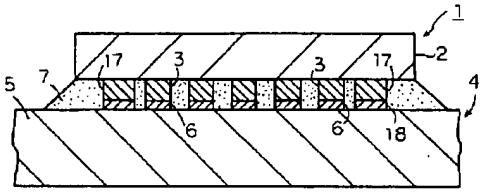
【図１１】　図９装置に用いられる配線基板の要部斜視図

【図１２】　図９装置の製造方法を説明する側断面図

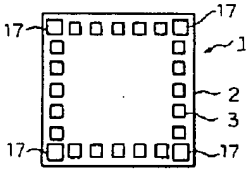
【符号の説明】

1	半導体ペレット
3	バンプ電極（径小パッド電極）
4	配線基板
6	パッド電極（径小パッド電極）
7	樹脂
１７	径大バンプ電極
１８	径大パッド電極

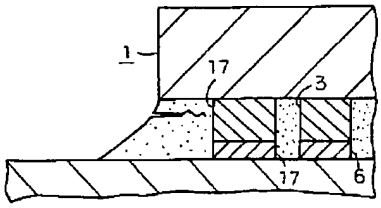
【図1】



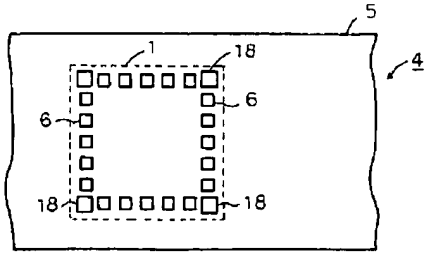
【図2】



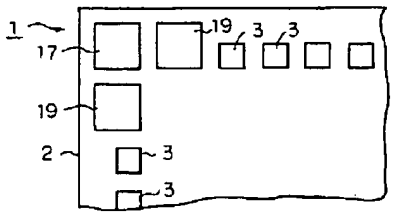
【図4】



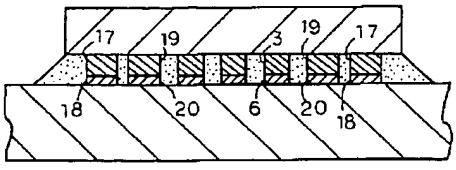
【図3】



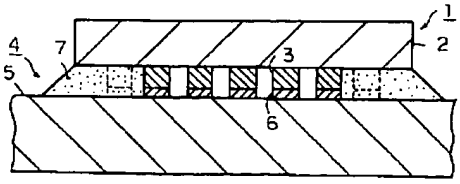
【図6】



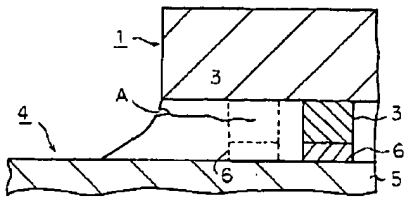
【図5】



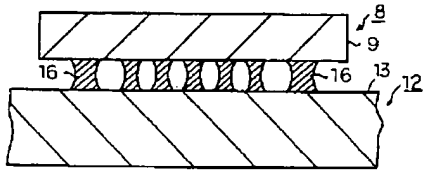
【図7】



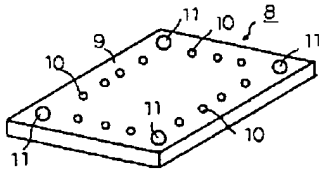
【図8】



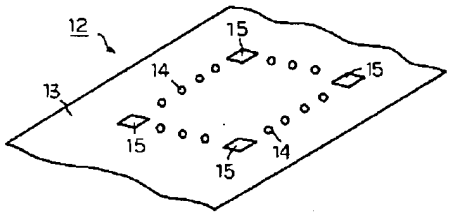
【図9】



【図10】



【図11】



【図12】